

INSERT FOR LOCKING MECHANISM FOR GROUND ENGAGING TOOLS

FIELD OF THE INVENTION

[0001] This invention relates to the field of locking and coupling mechanisms for retaining wear members on support structures and, preferably, for use with ground-engaging tools.

BACKGROUND OF THE INVENTION

[0002] Buckets on digging machines are generally equipped with replaceable ground-engaging teeth. These teeth attach to adapters or adapter bases, which indirectly attach the teeth to the bucket lip. The teeth, as well as the adapters, wear over time and therefore need to be replaced frequently during operation. As well, lock mechanisms that couple these together and/or to the base must be easy to use to minimize downtime of the equipment.

[0003] Worker safety is also an important issue. Adapter locking mechanisms are often the older type commonly called wedge-and-spool. These locks are comprised of two pieces that are hammered into an opening in the wear member and the support structure on which the wear member is placed. Once hammered into place, they are often spot-welded to ensure they do not come loose during use of the tool. As a result, wedge-and-spool locks are difficult to remove and sometimes shatter during installation or removal, endangering the safety of nearby workers.

[0004] Other locking mechanisms have been designed to overcome these disadvantages. However, many of these systems require specific features in the wear members or support structures. Ground-engaging buckets are used for many years before they are replaced. Adapter bases are attached to the bucket lips. Adapters are welded or locked onto the bases. Most of these adapters have openings that correspond to openings in opposing walls of the adapter bases or bucket lips and are designed to work with older-type locking mechanisms rather than newer locking mechanisms that are more efficient and safer to use.

[0005] There is therefore a need for a means of attaching wear members, such as teeth or adapters, having a newer design to support structures, such as adapters or adapter

bases, designed to be used with older-type locking mechanisms using a modern coupling system without the need for retrofit. There is also a need for such an assembly that is safe and easy for workers to use.

SUMMARY OF THE INVENTION

[0006] One aspect of the present invention is directed to an insert for use, in combination with a locking assembly, for attaching a work piece to a support structure. The work piece and support structure respectively have a first and second passage which are in communication when the work piece is operatively coupled to the support structure. The insert comprises an elongated body for insertion into the second passage in the support structure. The body has two opposing ends and a longitudinal axis. It also preferably has attachment means at at least one of the opposing ends for engaging the work piece or the lock assembly when the work piece is operatively coupled to the support structure.

[0007] In a further aspect of the present invention, the insert has attachment means at one end that comprises a faceplate generally perpendicular to the longitudinal axis of the body. When the insert is inserted in the second passage, the faceplate is positioned between the work piece and the support structure when they are operatively coupled. The faceplate preferably engages corresponding slots or other attachments means on the inner surface of the work piece. Also, the faceplate preferably has a recess in its outer surface for receiving one end of a lock pin or other locking assembly inserted into the first passage for locking the work piece to the support structure.

[0008] In a further aspect of the present invention, the work piece will have a first passage extending through its upper surface as well as a third passage extending forward from its rear end in a generally longitudinal direction, wherein the passage of the support structure and those of the work piece are in communication. When the insert is positioned in the second passage in the support structure, the faceplate of the insert will extend from the second passage to engage attachment means, such as a slot, in the third passage in the work piece. A locking assembly would engage the rearward end of the faceplate, by having a lock pin extend through the first passage and abut against the rearward end of the faceplate, for maintaining the work piece on the support structure. Alternatively, a pin carrier may be inserted into the third passage to abut against the

rearward end of the faceplate, and the lock pin would extend through the first passage to engage the pin carrier for maintaining the work piece on the support structure.

[0009] In a further aspect of the present invention, the insert extends only partially through the second passage or alternatively, is comprised of two inserted pieces of which one or both may be used. When two inserts are used, they may interconnect at their inner ends. This is preferred since the inserts are thereby retained in the second passageway until the work piece is placed on the support structure.

[0010] A further aspect of the present invention is directed to a method for locking a work piece to a support structure wherein the work piece and support structure respectively have a first and second passage that are in communication when the work piece is operatively coupled to the support structure. The method includes the steps of inserting the insert into the second passage in the support structure; positioning the work piece on to the support structure in an operative position; engaging the insert with the work piece; and using a locking assembly to lock the work piece to the support structure. Preferably, a lock pin extends through the first passage and into a recess in the end of the insert.

[0011] Other aspects and features of the present invention will become apparent to those ordinarily skilled in the art upon review of the following description of specific embodiments of the invention in conjunction with the accompanying figures.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] Embodiments of the present invention will now be described, by way of example only, with reference to the attached Figures, wherein:

Figure 1 is a top-side elevated view of one embodiment of the insert of the present invention for use with an adapter base;

Figure 2 is a bottom-side elevated view of the insert shown in Figure 1.

Figure 3 is front view of the insert shown in Figure 1;

Figure 4 is a cross-sectional view of the insert taken along line 4-4 in Figure 3.

Figure 5 is a side view of the insert shown in Figure 1;

Figure 6 is a front view of a second embodiment of the insert of the present invention;

Figure 7 is a top view of the insert shown in Figure 6;

Figure 8 is a bottom view of the insert shown in Figure 6;

Figure 9 is a side view of the insert shown in Figure 6;

Figure 10 is a cross-sectional view taken along line C-C in Figure 7;

Figure 11 is a cross-sectional view of an adapter positioned on an adapter base and having an insert of Figure 6 positioned therein, where the adapter is locked to the adapter base with a lock pin and lock retainer;

Figure 12 is a front cross-sectional view taken along line C-C of Figure 11;

Figure 13A is a perspective schematic view of the insert of Figure 1 illustrating the faceplate on the upper surface of the adapter base;

Figure 13 B is a perspective schematic view of the insert of Figure 1 illustrating the bottom end of the insert extending from the passage of the adapter base;

Figure 14 is a bottom elevational view of a ground-engaging tooth and lock retainer;

Figure 15 is a front perspective view of an adapter and passage opening;

Figure 16 is a perspective view of a ground-engaging tooth on an adapter with a lock pin to be inserted into the opening in the tooth;

Figure 17 is a side view of a further embodiment of the insert of the present invention;

Figure 18 is a further embodiment of the insert of the present invention; and

Figure 19 is a side, perspective view of the inserts shown in Figures 17 and 18 coupled together in a passage in an adapter base.

DETAILED DESCRIPTION

[0013] Generally, the present invention provides for an insert that can be used in a passageway extending through a support structure to provide for a means to lock a wear member to the support structure using a modern locking system. It is used with locking systems that lock the wear member to the support structure but which do not require special attachments in the support structure passageway. The insert is preferably used with older designed support structures having a passage extending through the support structure to generally align with at least one passage in matching old-style wear members. The insert

may also be used with these older designed support structures and with newer-style wear members having a passage in communication or contiguous with the passage in the support structure or having two passages in the wear member, one extending through the upper leg of the wear member and one extending from the rearward end of the wear member in a generally longitudinal direction of the wear member, both of which are in communication or contiguous with the passage in the support structure.

[0014] Embodiments of the insert of the present invention are described and shown in Figures 1 to 13 and 17 to 19 with reference to the locking of an adapter to an adapter base. Figures 14 to 16 show the locking of a tooth to an adapter. The present invention is not limited to such embodiments as will be described in more detail. "Wear members" is meant to refer to both adapters as well as ground-engaging teeth. Support structures may include adapters, adapter bases, or bucket lips. These terms may also be interpreted in accordance with broader definitions, and industries other than ground-engaging tools, that requiring the locking and removal of work pieces to and from a support structure.

[0015] The present insert may be used with a support structure having a passageway which extends through the support structure in a vertical or horizontal direction, i.e. extending from top to bottom or from side to side of the support structure. Preferably, the insert will be tipped at each end with some attachment points that engage corresponding shaped slots on the inside wall of the wear member at one or both of its ends. Alternatively, it will not engage any slots on the wear member but will be held in place simply by the positioning of the wear member over the support structure.

[0016] With reference to the figures, the insert of one embodiment of the present invention is shown in more detail in Figures 1-5 and 13. It is generally designated as 1 and has an elongated body 3 extending along the longitudinal axis L. During use, it is placed in a passageway in the adapter base and therefore the shape and length of the main body 3 will correspond to the shape and length of the passageway in the adapter base. At one end of the main body is a generally flat faceplate 5 that has an outer surface generally perpendicular to the longitudinal axis L of the insert. The faceplate has an increased thickness 6 on its forward face. As a result, the lower surface of the flat face may be at an angle, rather than generally perpendicular, to the longitudinal axis L of the main body. The faceplate 5 preferably has a larger area than the opening of the passage in the adapter base.

When the main body of the adapter base insert is placed in the adapter base passage, the faceplate will prevent the insert from passing through the passageway. This is shown in Figures 12 and 13A. The angle of the faceplate to the main body will vary according to the angle of the adapter base surface and the base passage. The outer surface of the faceplate has a recess 9 that generally aligns with a lock pin opening Q (shown for one embodiment in Figure 16) in the adapter when the adapter is placed over the adapter base.

[0017] The bottom end 11 of the adapter base insert opposite to the faceplate 5 has grooves 13 extending across the main body of the insert generally perpendicular to the longitudinal axis L. These grooves may be straight or curved as shown in Figures 2 and 3. The grooves 13 preferably engage corresponding slots on the inside surface of the adapter when the adapter is placed over the adapter base. As shown in Figure 13B, the end of the adapter base insert preferably extends through the passage in the adapter base. The grooves on the bottom end of the adapter base insert slide into engagement with the corresponding attachment means on the inner surface of the adapter. Accordingly, this bottom end of the adapter base insert may incorporate any attachment means that corresponds to attachment means on the inner surface of the adapter. In a less-preferred alternative, the end 11 of the adapter base insert does not engage the inner surface of the adapter.

[0018] During use, the faceplate is positioned on the outer surface of the adapter base as shown in Figure 13A and may engage attachment means on the inner surface of the adapter. In one example, two of the faceplate opposing edges engage corresponding slots on the inner surface of the adapter. Alternatively, when the adapter is positioned over the adapter base, the faceplate is positioned between the inner surface of the adapter and the adapter base. In this position, the adapter base insert cannot be removed from the passage.

[0019] An alternate embodiment of the insert is shown in Figures 6 to 12. The insert is shown generally as 21. Its main body is designated 23 with longitudinal axis L. The faceplate 25 has a configuration similar to that shown in Figure 1 with edges 27. It also has a recess 29 that generally aligns with a lock pin opening in the adapter when the adapter, adapter base, and adapter base insert are operatively assembled. The bottom end 31 of the insert has two grooves 33 extending around the longitudinal axis of the main body. The end 31 of the insert preferably engages corresponding slots on the inner wall of the adapter when

assembled. This engagement helps to retain the adapter tightly in place on the adapter base. It is, however, contemplated that, in less preferred embodiments, the end of the adapter base insert would not engage the adapter.

[0020] A further embodiment is shown in Figures 17-19. In this embodiment, the elongated body does not extend all the way through the passage in the adapter base but instead only extends through a portion of it. The insert consists of two elongated bodies. Each body has a faceplate at one end for engaging slots or other attachment means on the work piece. The faceplate is generally perpendicular to the longitudinal axis of the body and is preferable larger than the passage in the adapter base. The opposing ends of the elongated bodies interconnect through mating attachments. One example is shown in Figure 19 although others may be used. Alternatively, the bodies may simply extend part of the way through the passage and not interconnect to each other or only one of these inserts may be used.

[0021] The insert may be used with a variety of locking means that use a lock pin to engage the adapter and the adapter base. Figures 11 and 12 show the adapter base insert assembled with an adapter T, adapter base A, and locking assembly. The locking assembly is described in more detail in Canadian Application No. 2,312,550. The adapter base insert is positioned in the passage in the adapter base. A lock retainer I is placed in a recess R in the inner surface of the adapter and the adapter is placed over the end of the adapter base in an operative manner. The faceplate 25 of the insert engages a corresponding slot on the inner surface of the adapter and the faceplate's lower surface contacts the outer surface of the adapter base. The bottom end 31 of the insert extends through the passage and engages corresponding slots on the inner surface of the adapter. The recess 29 in the faceplate of the adapter base insert aligns with the lock pin opening in the adapter. A lock pin P is inserted into the opening and tightened into the lock retainer. The end of the lock pin will extend into the recess 29 of the adapter base insert but the adapter base insert will not prevent the pin from being fully tightened into the lock retainer. A cross-section of this assembly is shown in Figure 12. During use of the adapter, the end of the lock pin would contact the adapter base insert. The adapter base insert would therefore bear some of the wear member-removal forces from the pin and transfer them to the support structure. Depending on the particular locking assembly used, the adapter base insert may contact the locking pin, lock retainer, or

other parts of the locking assembly during use of the wear member and bear forces from them.

[0022] In a further alternative embodiment, the insert may be used with an adapter having a first passage extending through its upper leg and a second passage extending from its rear end along its longitudinal axis. The adapter base will have a passage extending through it that communicates with the passages of the adapter. The faceplate of the insert will preferably have a flat surface at its rearward-facing end. When the insert is positioned in the passage in the adapter base, the faceplate of the insert will extend above the surface of the adapter base. As the adapter is positioned on the nose of the adapter base, the faceplate will engage a slot on the inner surface of the longitudinally-extending passage of the adapter. When the adapter is operatively positioned on the adapter base, the opening of the upper passage in the adapter will be positioned near the back edge of the faceplate so that a lock mechanism, such as a pin, inserted into this opening will be positioned between the back edge of the faceplate and the rear edge of the opening of the upper passage for locking the adapter to the adapter base. Alternatively, a pin carrier may be inserted into the slot on the inner surface of the longitudinally-extending passage of the adapter to be in abutment against the back edge of the faceplate. The pin, upon being inserted into the opening in the adapter upper passage, would be received in the pin carrier for locking the adapter to the adapter base. An example of a wear member and locking mechanism for use with the insert in this manner is described in more detail in Canadian patent application no. 2,274,236 and U.S. pending application 10/223,889 both entitled "Assembly for Fastening a Ground Engaging Tool to a Support Structure".

[0023] The present invention is discussed by reference to the coupling of adapters to adapter bases on ground-engaging bucket lips. However, its use is not limited to only these embodiments and it may be used for coupling any first work piece to a second work piece. With ground-engaging tools, it may, for example, also be used to couple a tooth to an adapter, an adapter base to a bucket lip or an adapter directly to a bucket lip without the use of an adapter base. As an example, Figures 14 to 16 show a ground-engaging tooth and adapter assembly with the same lock assembly as is shown in Figures 11 and 12. The insert may be positioned in passage O in the adapter S. The pin retainer I is placed in recess R in

the ground-engaging tooth W that is then positioned on the working end of the adapter S as shown in Figure 16. The pin is then inserted into the passage Q in the tooth W.

[0024] The above-described embodiments of the present invention are intended to be examples only. Alterations, modifications and variations may be effected to the particular embodiments by those of skill in the art without departing from the scope of the invention, which is defined solely by the claims appended hereto.